FUEL SUPPLY SYSTEM, SERVICING

FUEL SUPPLY SYSTEM, GENERAL INFORMATION

NOTE:

- **Hose connections are secured with either spring-type or clamp-type clips.**
- **Always replace clamp-type clips with spring-type clips.**
- **Fuel hoses of engine must only be secured with spring type clips. The use of clamp or screw-type clips is not permitted.**
- **Fuel extraction unit VAS 5190 is recommended to empty fuel tank.**

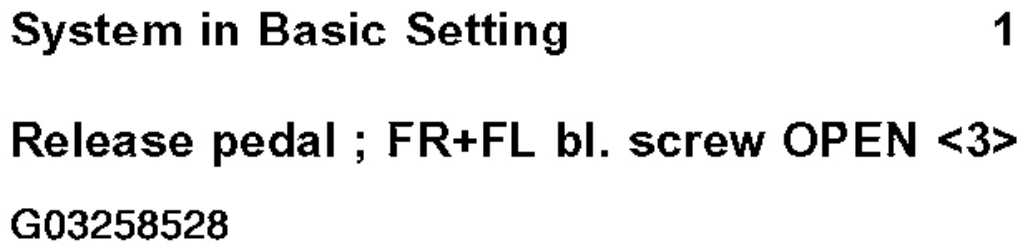

Fig. 1: Identifying Special Tool (1 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- **Always replace clamp-type clips with spring-type clips. Assembly tool VAS 5024 or hose clip pliers V.A.G 1921 are recommended for installing spring-type clips.**

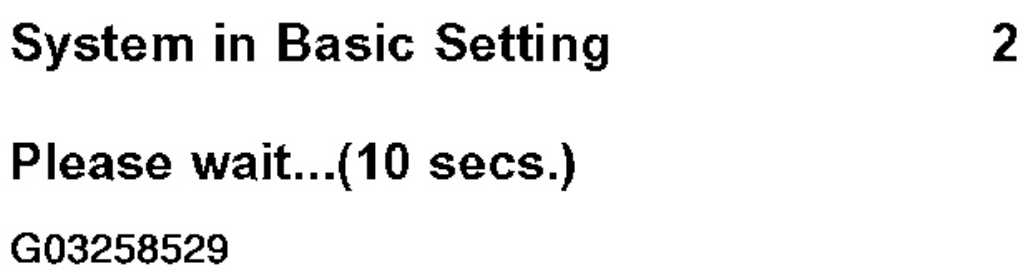

Fig. 2: Identifying Special Tool (2 Of 2)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing and installing fuel tank with attachments and fuel filter. See **FUEL TANK AND ATTACHMENTS / FUEL FILTER, REMOVING AND INSTALLING** .

Observe safety precautions. See **SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM** .

Observe rules for cleanliness. See **RULES FOR CLEANLINESS** .

Servicing accelerator mechanism. See **ACCELERATOR MECHANISM, SERVICING**

Models without EPC

Adjusting accelerator cable. See **ACCELERATOR CABLE, ADJUSTING** .

Vehicles with Electronic Power Control (EPC)

Checking electronic accelerator (EPC). See **ELECTRONIC POWER CONTROL (EPC)**

Continuation for all models

Observe crash fuel shut-off. See **CRASH FUEL SHUT-OFF** .

Servicing parts of the Evaporative Emissions (EVAP) system. See **EVAP SYSTEM COMPONENTS, SERVICING** .

FUEL TANK AND ATTACHMENTS / FUEL FILTER, REMOVING AND INSTALLING

NOTE: The following list refers to items in Fig. 3 .

1. **Cover**
2. **Seal**
   - Replace if damaged
3. **1 N.m**
4. **Tank flap unit**
   - With rubber cup
5. **10 N.m**
6. **Breather pipe**
7. **Change-over valve**
   - To remove valve unclip sideways out of socket
   - Remove cap item -1- before installing
   - Check. See **Checking Change-Over Valve**
8. **O-ring**
   - Replace if damaged
9. **To EVAP canister**
   - See **EVAP SYSTEM COMPONENTS, SERVICING**
10. **Cable guide**
    - In longitudinal member
11. **Breather pipe**
    - Check if seated securely
    - Secure with spring-type clips
12. **Fuel tank**
    - When removing, support with engine/transmission jack V.A.G 1383 A
      - Removing and installing. See **FUEL TANK, REMOVING AND INSTALLING**
13. **Heat shield**
    - For fuel tank
14. **Clamping washer**
15. **Fuel tank cover**
16. **20 N.m + 1/4 turn (90°) further**
    - Replace
17. **Securing strap**
    - Note differing lengths
    - Installed position: Fixing point (holes) point in direction of travel (forward)
18. **Fuel filter**
    - Installed position: Arrow points in direction of flow

    Engine codes BEV, BGD:

- Removing and installing fuel pressure regulator. See **Removing And Installing Fuel Pressure Regulator**
- If fuel filter has been replaced, fuel system must be bled. See **FUEL SYSTEM, BLEEDING** .

19. **Screw-type clip**
    - Observe installed position. See **Installed Position Of Screw-Type Clamp For Fuel Filter**
20. **Supply line**
    - Black
    - Check if seated securely
    - To pull off of fuel filter press locking ring inward on connecting piece
21. **Breather pipe**
    - White
    - Clipped onto top of fuel tank
    - Check if seated securely
    - To EVAP canister purge regulator valve -N80-.
22. **Seal**
    - Replace if damaged
    - When installing, insert seal dry into fuel tank opening
    - Moisten with fuel only when installing fuel delivery unit flange.
23. **Fuel delivery unit**
    - Observe installed position of flange on fuel tank. See **Installed Position Of Flange Of Fuel Delivery Unit** .
    - Removing and installing. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .
    - Removing and installing fuel gauge sender. See **FUEL GAUGE SENDER, REMOVING AND INSTALLING** .
    - Checking fuel pump. See **FUEL PUMP, CHECKING** .
    - Clean strainer if soiled
24. **Union nut, 75 N.m**
    - Remove and install with key 3217
25. **Supply line**
    - Black
    - Check if seated securely
    - Clipped onto side of fuel tank
    - When pulling off flange and fuel filter press locking ring on connecting piece
26. **Return line**
    - Blue or with blue marking
    - Clipped onto side of fuel tank
    - Check if seated securely
    - To remove from flange press release button on connecting piece

Engine codes BEV, BGD:

- From fuel filter

All other engines:

- From fuel return line on fuel rail

27. **Gravity valve**
    - To remove valve unclip upward out of support
    - Check valve for through flow, Valve vertical: Open; Valve tilted 45° : Closed
28. **Pressure retention valve**
    - For fuel tank breather
    - Checking. See **Checking Pressure Retention Valve**
29. **Ground connection**
    - Check if seated securely

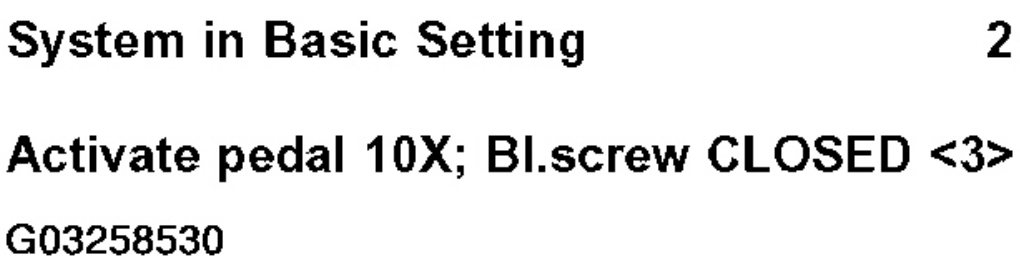

Fig. 3: Exploded View Of Fuel Tank/Fuel Filter Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installed Position Of Flange Of Fuel Delivery Unit

Marking on sender must align with the marking on fuel tank (arrows).

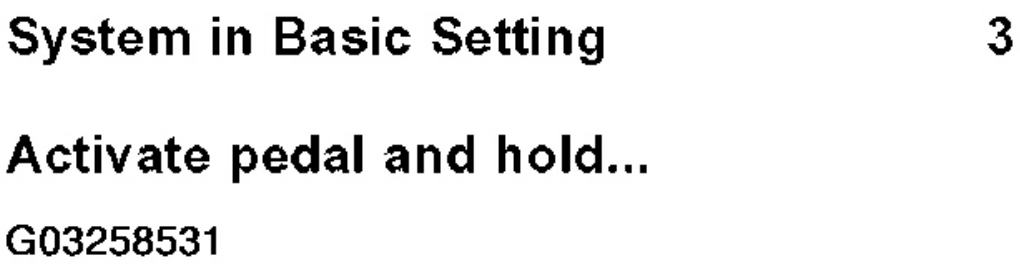

Fig. 4: Aligning Fuel Delivery Unit Flange With The Marking On Fuel Tank
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Blue or blue marked return line -1- to connection with identification -R-.

Black supply line -2- to connection with identification -V-.

NOTE: After installing fuel delivery unit flange, check that the supply, return and breather pipes are still clipped onto the fuel tank.

Checking Change-Over Valve

Lever in rest position: Closed

Lever pushed in direction of arrow: Open

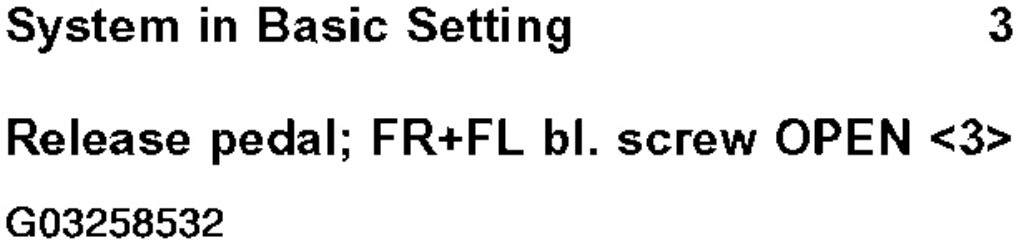

Fig. 5: Checking Change-Over Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Before installing vent valve remove cap from fuel tank.

Checking Pressure Retention Valve

The pressure retention valve is opened in both through-flow directions from the gravity valve/pressure retention valve (arrow -1-).

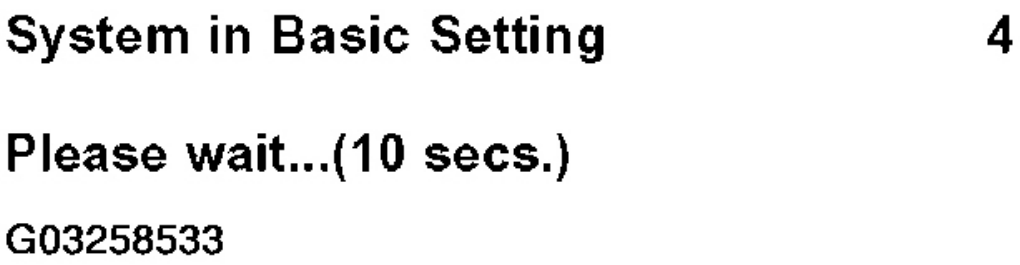

Fig. 6: Checking Pressure Retention Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

It is opened only in one through-flow direction from the EVAP system/solenoid valve junction piece (arrow -2-).

Checking direction of valve flow. See **CHECKING DIRECTION OF VALVE FLOW** .

Checking direction of valve flow

NOTE: The following list refers to items in Fig. 6 .

A. Union 1 1:
   - Flow in both directions
   - Union -2- is closed

B. Union 1 - 2:
   - Flow in both directions
   - Union - 3 is closed

C. Union 1 2:
   - Flow in only one direction
   - Union -3- is closed
   - Valve must close when a vacuum is applied to union -1-

Installed Position Of Screw-Type Clamp For Fuel Filter

NOTE: The fuel filter is illustrated viewed from the front.

- Install screw-type clamp (arrow) as shown in illustration.

  Ensure sufficient clearance between clamp fastener and fuel tank:

  Dimension "a" must be at least 5 mm

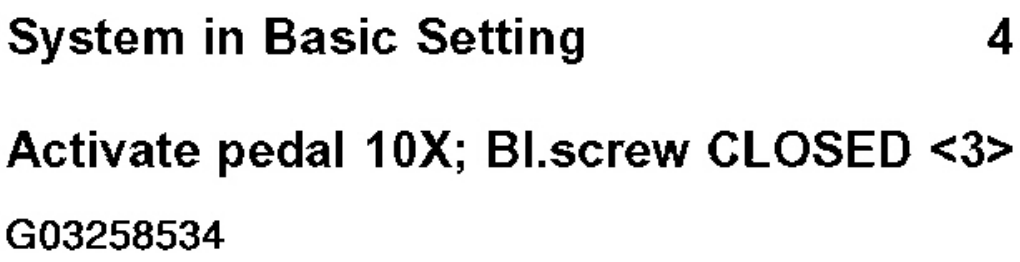

Fig. 7: Identifying Installed Position Of Screw-Type Clamp For Fuel Filter
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing And Installing Fuel Pressure Regulator

NOTE: The following list refers to items in Fig. 8 .

1. Fuel filter
   - Arrows show flow direction
2. Rubber hose
3. Retaining clip
   - Check if seated securely
4. Ground strap
   - Mounted on fuel filter retainer
5. Supply pipe
   - From fuel pump
6. Return pipe
   - To fuel pump
7. Fuel pressure regulator

- Checking. See **FUEL PRESSURE REGULATOR AND HOLDING PRESSURE, CHECKING** .

8. Seal
    - Replace
9. O-ring
    - Replace
10. Supply pipe
    - To union in fuel tank

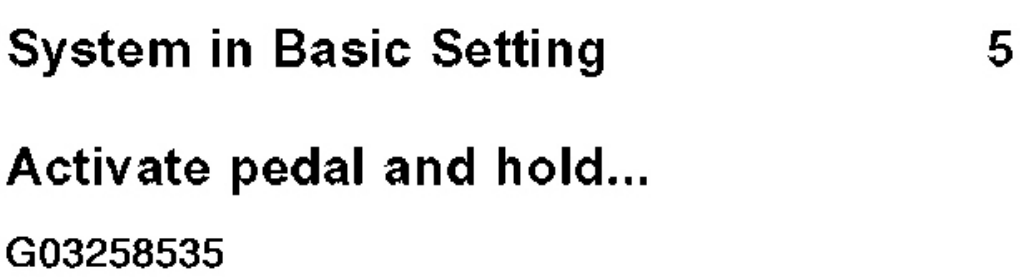

Fig. 8: Exploded View Of Fuel Filter & Fuel Pressure Regulator Assembly
Courtesy of VOLKSWAGEN OF AMERICA, INC.

SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM

CAUTION: When performing repair work, especially due to the confined conditions in the engine compartment, pay attention to the following:

- **Route all types of lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum) as well as electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

When removing and installing the fuel gauge sender or fuel pump (fuel delivery unit) from a full or partly full fuel tank the following must be observed:

WARNING: Fuel supply lines are under pressure! Before removing a hose connection wrap a cloth around the connection. Then release pressure by carefully pulling the hose off the connection.

- Before beginning work, switch on the exhaust extraction system and place an extraction hose close to the

sender opening in the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a radial fan with a displacement greater than 15 m3/h can be used (as long as motor is not in air flow).

- Prevent skin contact with fuel! Wear fuel-resistant gloves!
- For safety reasons, fuse No. 28 must be removed from fuse holder before opening fuel system because fuel pump can be activated by door contact switch in driver's door.

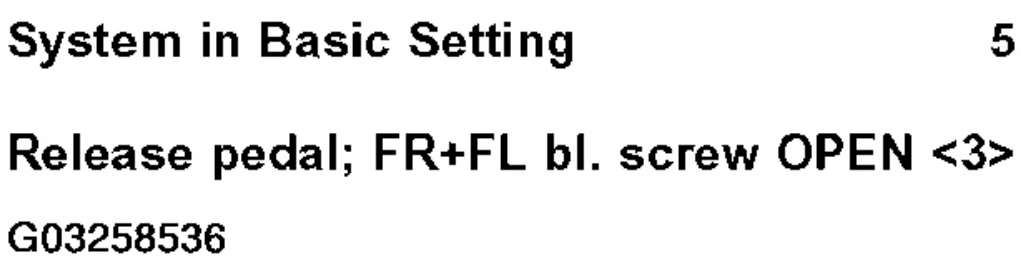

Fig. 9: Locating Fuse Box (Behind Access Panel At Far Left End Of Dash)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

RULES FOR CLEANLINESS

When working on the fuel supply/injection system, pay careful attention to the following 5 rules:

- Thoroughly clean all unions and the adjacent areas before disconnecting.
- Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- Carefully cover opened components or seal, if the repair cannot be performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- When the system is open: Do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.

FUEL DELIVERY UNIT, REMOVING AND INSTALLING

Special tools, equipment, testers, measuring instruments and auxiliary items required

- 3217 Union nut spanner

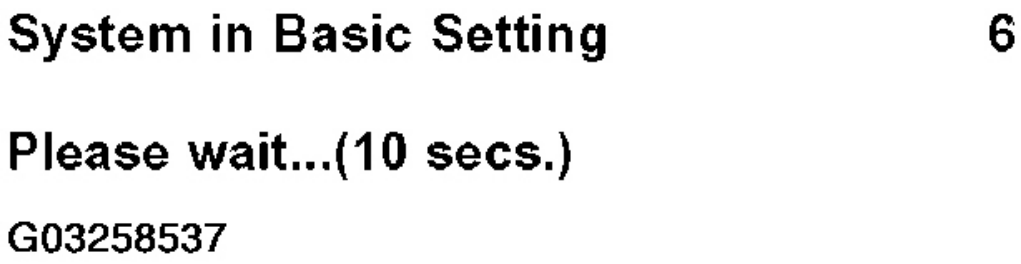

Fig. 10: Identifying 3217 Union Nut Spanner
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1332 Torque wrench (40-200 N.m)

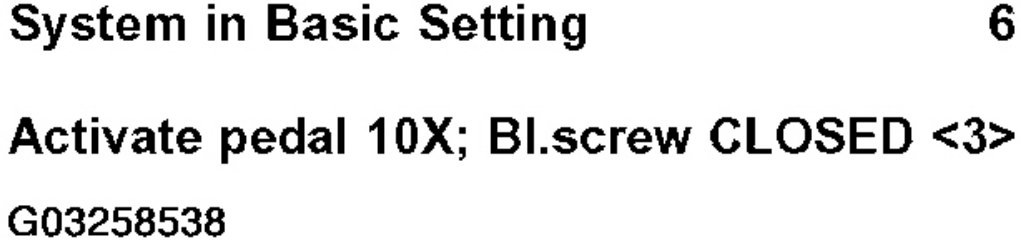

Fig. 11: Identifying V.A.G 1332 Torque Wrench
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

Requirements

- Fuel tank must only be a maximum 1/2 full.

NOTE:

- **If necessary empty fuel tank with fuel extraction unit VAS 5190**
- **Observe safety precautions before starting work. See SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM .**

WARNING: Fuel supply lines are under pressure! Before removing a hose connection wrap a cloth around the connection. Then release pressure by carefully pulling the hose off the connection.

- Check whether a coded radio is installed. If so, obtain anti-theft coding.
- With ignition switched off disconnect battery Ground strap.
- Fold rear seat bench forward.
- Remove cover from fuel delivery unit.
- Disconnect 4-pin connector as well as supply and return lines from flange (arrows).

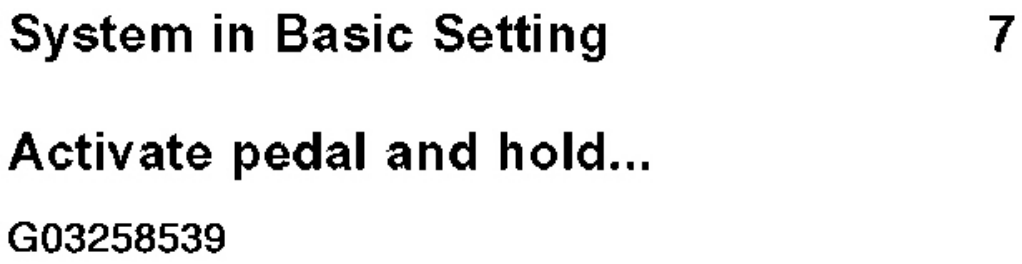

Fig. 12: Disconnecting 4-Pin Connector, Supply And Return Lines From Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Press buttons on hose couplings to disconnect.

- Seal lines to avoid contamination of fuel system.
- Remove union nut with spanner 3217.

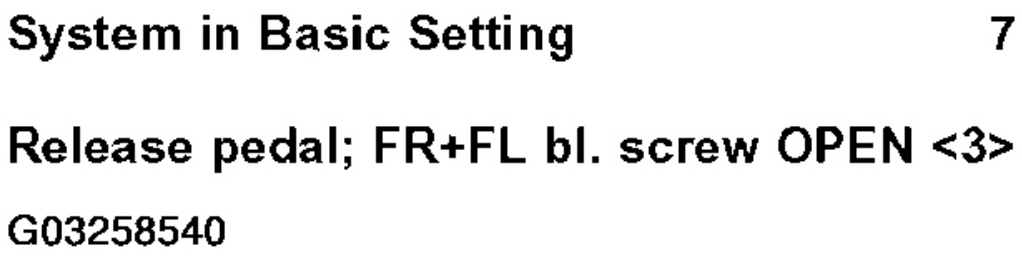

Fig. 13: Removing Union Nut With Spanner
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull fuel delivery unit and seal out of opening in fuel tank.

NOTE: **If the delivery unit is to be replaced then drain old delivery unit before disposal.**

Installing

Installation of the fuel delivery unit is performed in reverse order.

NOTE:

- **Insert seal for fuel delivery unit flange "dry" into opening of fuel tank.**
- **Moisten seal with fuel only when installing fuel delivery unit flange or fuel delivery unit.**
- **When inserting fuel delivery unit be careful to ensure that the fuel gauge sender does not become bent/deformed.**
- **Note installed position of flange of fuel delivery unit: Marking on flange must align with marking on fuel tank (arrows).**

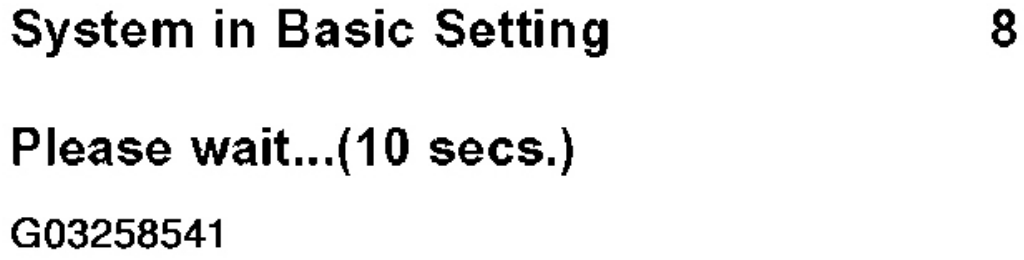

Fig. 14: Connecting 4-Pin Connector, Supply And Return Lines From Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- **Ensure tight fit of fuel hoses.**
- **After installing the fuel delivery unit, check that the supply, return and vent lines are still clipped onto the fuel tank.**

- Adapt (match) engine control module to throttle valve control module. See **COMPONENTS AND FUNCTIONS, ADAPTING** .
- If fault memory has been erased or engine control module was disconnected from permanent positive,

adapt respective components to engine control module (see **COMPONENTS AND FUNCTIONS, ADAPTING**), and generate readiness code again.

FUEL GAUGE SENDER, REMOVING AND INSTALLING

Removing

- Install fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .
- Release and disconnect terminals for wires -3- and -4-.
- Lift retaining tabs -1- and -2- with a screwdriver and pull fuel gauge sender out downward (arrows).

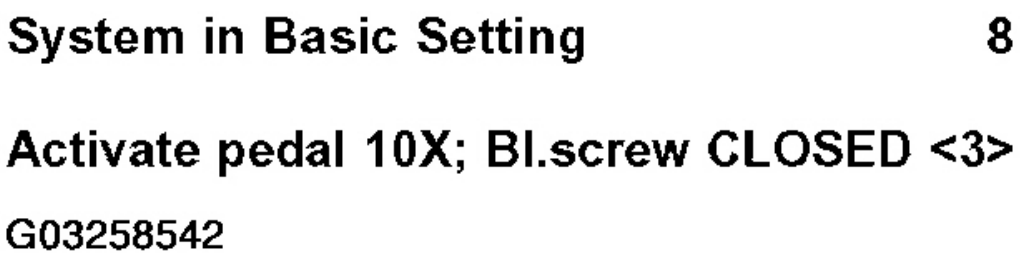

Fig. 15: Removing And Installing Fuel Gauge Sender
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing

- Insert fuel gauge sender in guides on fuel delivery unit and push up until it engages.
- Install fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .

FUEL TANK, REMOVING AND INSTALLING

Special tools, equipment, testers, measuring instruments and auxiliary items required

- V.A.G 1383 A Engine/transmission jack

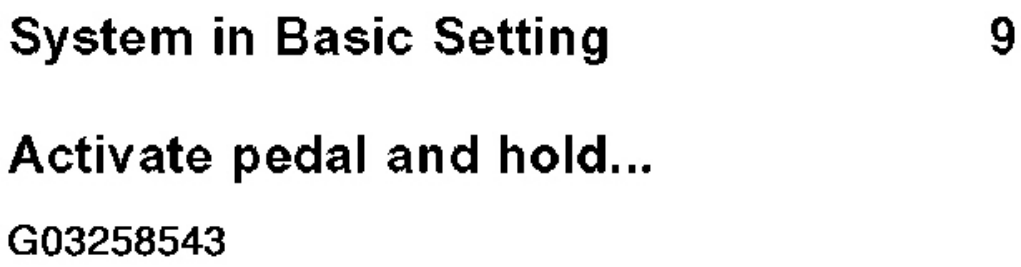

Fig. 16: Identifying V.A.G 1383 A Engine/Transmission Jack
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1331 Torque wrench (5-50 N.m)

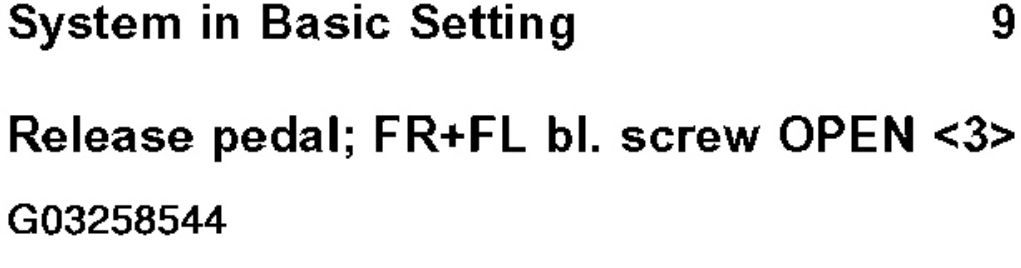

Fig. 17: Identifying V.A.G. 1331 Torque Wrench
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Removing

NOTE:

- **Observe safety precautions before starting work. See SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM .**
- **Fuel extraction unit VAS 5190 is recommended to empty the fuel tank.**

- Check whether a coded radio is installed. If so, obtain anti-theft coding.
- With ignition switched off disconnect battery Ground strap.
- Open fuel flap.
- Remove rear axle:

See **AXLE BEAM** .

- Remove right rear wheel housing liner:

  See **REAR WHEEL HOUSINGS LINER, ASSEMBLY OVERVIEW** .

- Remove cover for fuel tank (arrows).

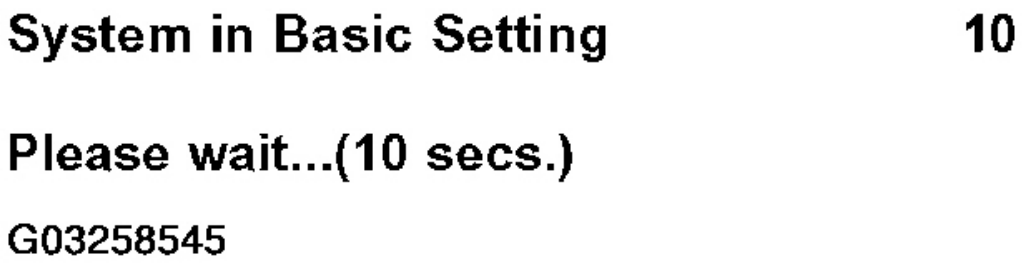

Fig. 18: Removing Fuel Tank Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Drain fuel tank, clean fuel filler neck and surrounding area.
- Disconnect breather lines/hoses on filler neck.
- Remove mounting screw and remove tank flap unit with rubber cup.

  See **FUEL TANK FILLER FLAP UNIT, REMOVING AND INSTALLING** .

- Pull EVAP canister breather lines off.
- Unhook gravity valve.
- Remove securing bolt on filler neck.
- Fold rear seat bench forward.

WARNING: Fuel supply lines are under pressure! Before removing a hose connection wrap a cloth around the connection. Then release pressure by carefully pulling the hose off the connection.

- Remove cover from under fuel tank.
- Remove cover from fuel delivery unit.
- Remove 4-pin connector from flange (arrow).

WARNING: Fuel supply lines are under pressure! Before removing a hose connection wrap a cloth around the connection. Then release pressure by carefully pulling the hose off the connection.

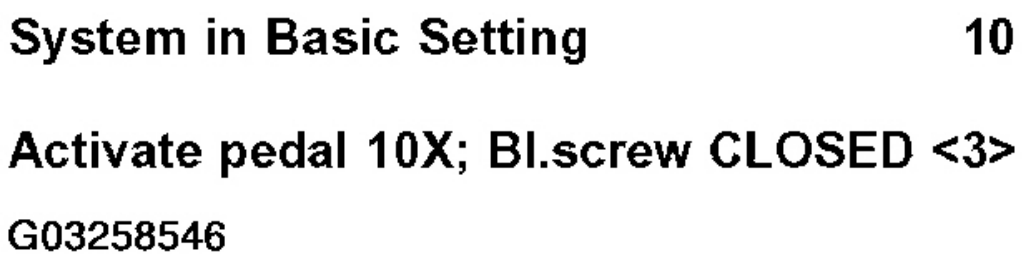

Fig. 19: Removing 4-Pin Connector From Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Disconnect return hose -2- (blue), supply hose -1- (black) and breather hose -3- (white) at connecting point.

NOTE: Press buttons on hose couplings to release.

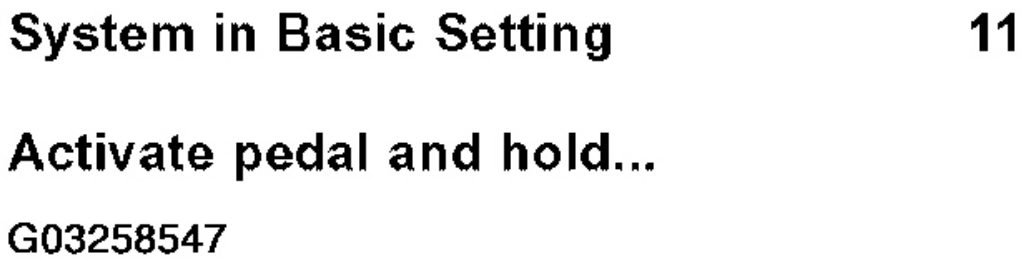

Fig. 20: Disconnecting Return Hose, Supply Hose And Breather Hose
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Seal lines to avoid contamination of fuel system.
- Remove tensioning strap. When doing this support fuel tank with engine/transmission jack V.A.G 1383 A.

- Lower fuel tank. Guide breather hoses/lines through longitudinal member while lowering tank.

Installing

Install in reverse sequence. Note the following points:

- Route breather and fuel hoses kink free.
- Ensure tight fit of fuel hoses.
- Guide breather hoses/lines through opening in longitudinal member (install line guide).
- Secure breather hoses/lines to filler neck with spring-type clamp.
- Do not interchange supply and return hoses (return hose blue or blue markings, supply hose black).

NOTE: After installing fuel gauge sender, check that the supply, return and breather lines are still clipped onto the fuel tank.

- Adapt (match) engine control module to throttle valve control module. See **COMPONENTS AND FUNCTIONS, ADAPTING** .
- If fault memory has been erased or engine control module was disconnected from permanent positive, adapt respective components to engine control module (see **COMPONENTS AND FUNCTIONS, ADAPTING**) and generate readiness code again.

GROUND STRAP FOR REPLACEMENT FUEL TANKS, INSTALLING

Condition

All replacement fuel tanks do not come with Ground strap (wire) installed.

Installing

NOTE: The Ground strap must be installed into all replacement fuel tanks.

CAUTION: Part numbers are for reference only. Always check with your Parts Dept. for the latest parts information.

Install Ground strap Part No. 1J0 201 184 into replacement fuel tank as follows:

- Remove fuel filler cap and observe cautions printed on cap.
- Bend up tab on inside of fuel filler pipe as shown (arrow).

NOTE: Fig. 21 shows Ground strap already installed.

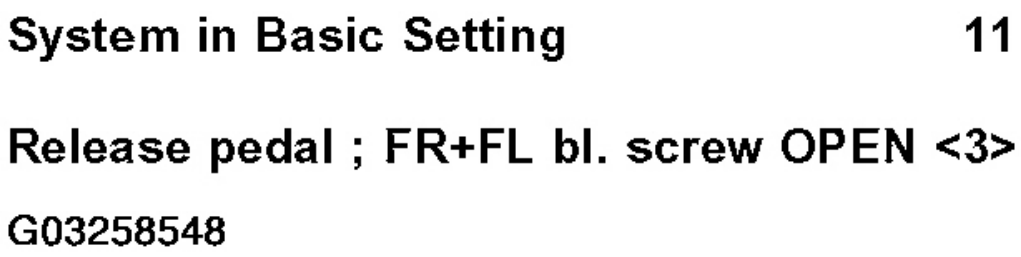

Fig. 21: Bending Up Tab On Inside Of Fuel Filler Pipe
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Insert end -A- of Ground strap through slot in tab up to bend -B- at other end of strap.

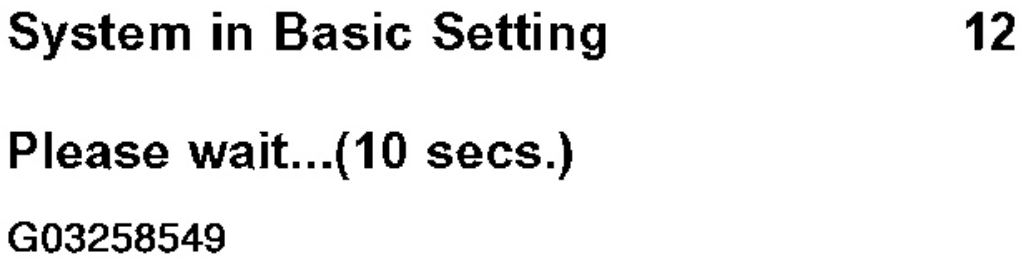

Fig. 22: Identifying Ground Strap
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Bend down tab on inside of fuel filler pipe. This will secure strap to end of tab.
- Reinstall fuel filler cap.

CRASH FUEL SHUT-OFF

Function

Models with an airbag are equipped with a crash fuel shut-off system. This system reduces the danger of a fire in a crash in that the fuel pump is switched off via the fuel pump relay. At the same time this system improves starting of the engine. When the door is opened the fuel pump is activated for 2 seconds to build up pressure in the fuel system.

When opening the fuel system:

- Observe safety precautions. See **SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM** .
- Check activation of fuel pump relay using wiring diagram and V.A.G 1466 A: See appropriate SYSTEM WIRING DIAGRAM article.

FUEL PUMP, CHECKING

Special tools, equipment, testers, measuring instruments and auxiliary items required

- 3217 Union nut spanner
- V.A.G 1318 Pressure gauge
- V.A.G 1318/11 Adapter
- V.A.G 1318/16 Hose adapter
- V.A.G 1318/17 Adapter
- V.A.G 1318/23 Adapter

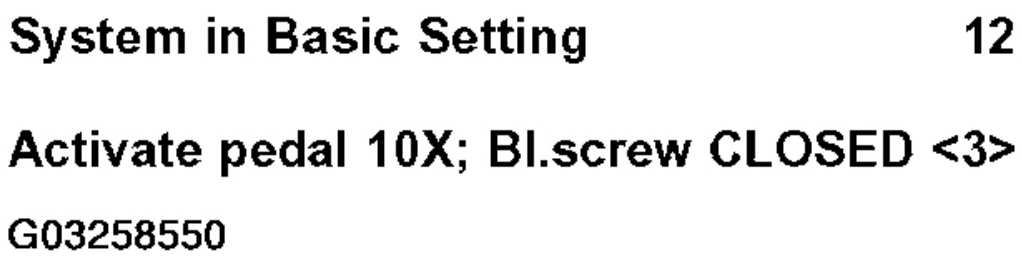

Fig. 23: Identifying Special Tools
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1332 Torque wrench (40...200 N.m)
- V.A.G 1348/3A Remote control with adapter cable V.A.G 1348/3-2
- V.A.G 1527 B Diode test lamp
- V.A.G 1594 A Adapter set
- V.A.G 1715 Multimeter
- Measuring container
- Wiring diagram

Requirements

- Fuse 28 must be OK.

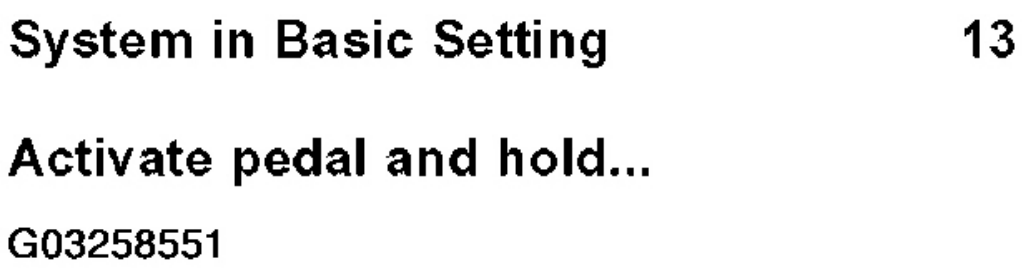

Fig. 24: Locating Fuse Box (Behind Access Panel At Far Left End Of Dash)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window defogger must be switched off.
- If the vehicle is equipped with air conditioning, this must be switched off.
- On models with an automatic transmission selector lever in position "P" or "N"

NOTE: Observe description of function of crash fuel shut-off. See CRASH FUEL SHUT-OFF .

Checking function and voltage supply

- Remove cover from fuel delivery unit.
- Briefly operate starter; fuel pump must be audibly starting.
- Switch off ignition.

If the fuel pump does not run:

- Remove cover in front of fuse holder.
- Pull fuse No. 28 out of fuse holder.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 to contact 28a to fuel pump and battery positive (+).

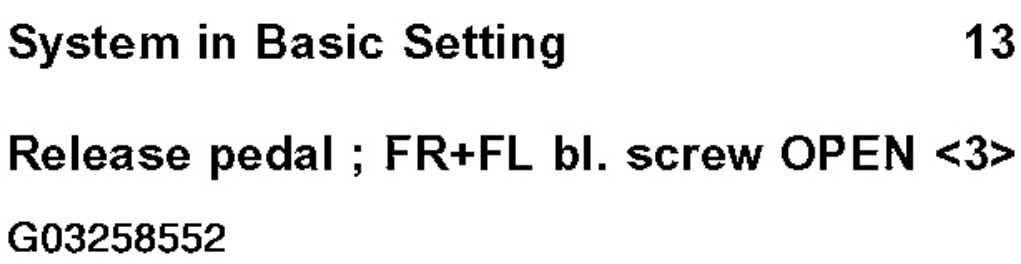

Fig. 25: Connecting Remote Control V.A.G 1348/3A To Fuel Pump Fuse Contact
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate remote control.

If fuel pump runs:

- Check activation of fuel pump relay referring to wiring diagram:

  See appropriate SYSTEM WIRING DIAGRAM article.

If fuel pump does not run:

- Remove 4-pin connector from flange (arrow).

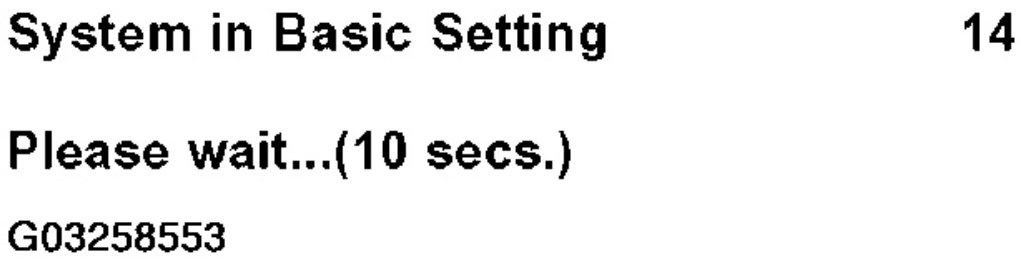

Fig. 26: Removing 4-Pin Connector From Flange
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect diode test lamp V.A.G 1527 B with adapter cables from V.A.G 1594 A to outer contacts of

connector.

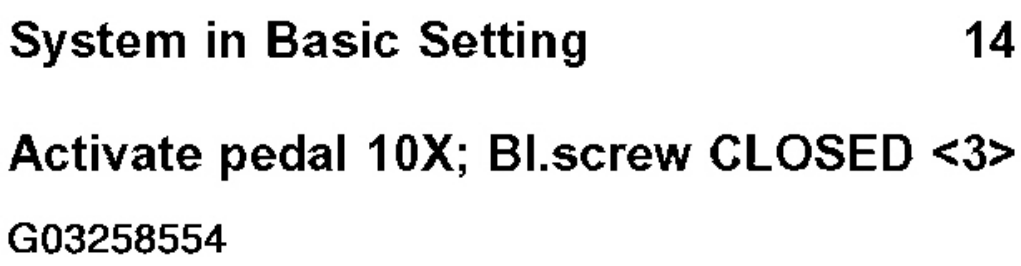

Fig. 27: Connecting Diode Test Lamp To Outer Contacts Of 4-Pin Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate remote control. LED must light up.

LED does not light up:

- Locate and eliminate open circuit referring to current flow diagram:

  See appropriate SYSTEM WIRING DIAGRAMS article.

LED lights up (voltage supply OK):

- Remove union nut with spanner 3217.

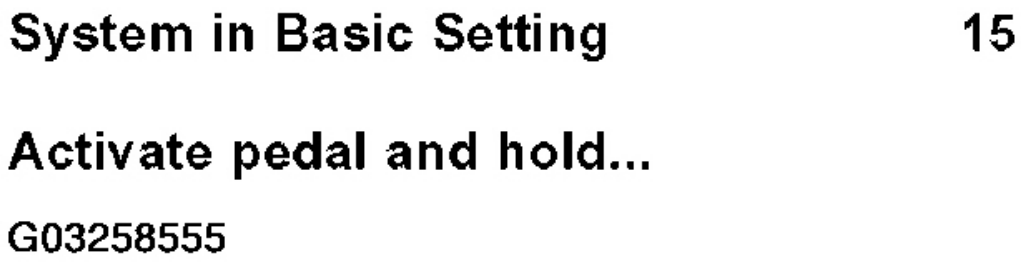

Fig. 28: Removing Union Nut With Spanner
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check that electrical wires between flange and fuel pump are connected.

If no open circuit can be found:

- Fuel pump faulty, replace fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .

Checking delivery rate

Requirements

- Voltage supply OK
- Remote control V.A.G 1348/3A connected

Work sequence

- Remove filler cap from fuel tank filler neck.

> **WARNING: The fuel system is under pressure! Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.**

- Pull off supply hose -3- (with white marking) (engine codes BEV, BGD: black markings) and collect fuel that leaks out with a cloth.

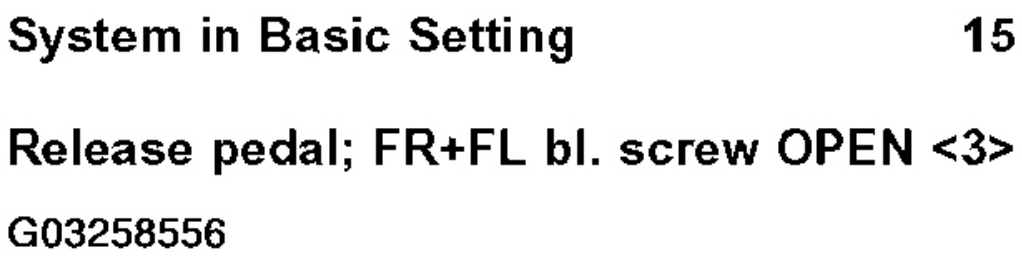

Fig. 29: Removing Fuel Supply Hose
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Press locking ring inward to release fuel line.

- Connect pressure gauge V.A.G 1318 with adapter V.A.G 1318/23 and V.A.G 1318/17 to fuel supply line.

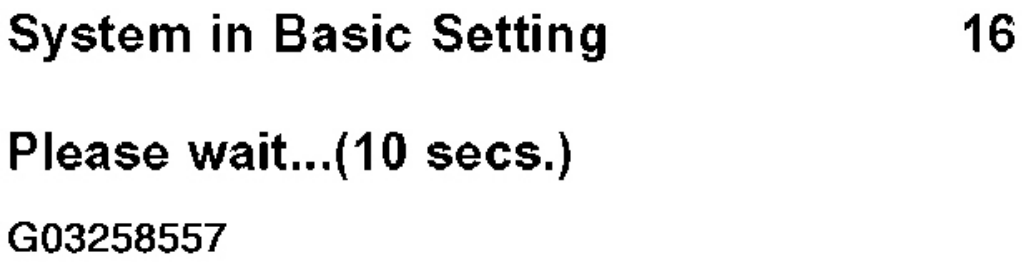

Fig. 30: Connect Pressure Gauge To Fuel Supply Line
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Push hose V.A.G 1318/16 onto adapter V.A.G 1318/11 on pressure gauge and hold hose in a measuring container.
- Open shut-off tap on pressure gauge. Lever then points in flow direction -A-.
- Operate remote control V.A.G 1348/3A. Close cut-off tap slowly, until pressure gauge shows 3 bar (except engine codes BEV and BGD). From now on do not alter setting of cut-off tap.

  For engine codes BEV and BGD: 3.5 bar

- Empty measuring container.

The quantity of fuel delivered by the fuel pump depends on the battery voltage. Therefore:

- Connect multimeter to vehicle battery using adapter cables from V.A.G 1594 A.
- Operate remote control for 30 seconds and measure battery voltage.
- Compare quantity of fuel delivered with nominal value.

NOTE: The following list refers to items in Fig. 31 .

*) Minimum delivery cm^3 /30 seconds

**) Voltage at fuel pump with engine at rest and pump running (approx. 2 volts less than battery voltage).

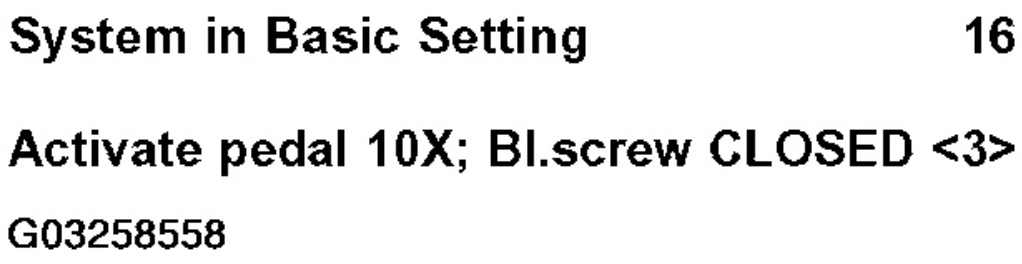

Fig. 31: Fuel Pump Delivery Reference Graph
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Example: During the test, a voltage of 12.5 volts is measured on the battery. As the voltage at the pump is approx. 2 volts less than the battery voltage, the result is a minimum delivery of 200 cm^3 /30 s.

If the minimum delivery rate is not attained:

- Check fuel lines for possible restrictions (kinks) or blockages.
- Pull fuel line -1- off input side of fuel filter.

NOTE: Press locking ring inward to release fuel line.

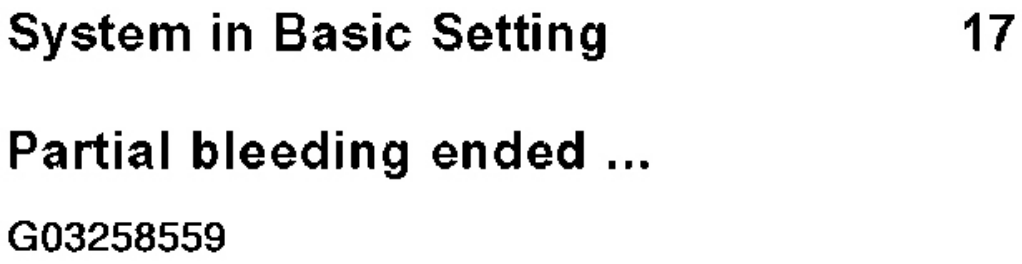

Fig. 32: Connecting Pressure Gauge With Adapter 1318/17 To Hose
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect pressure gauge V.A.G 1318 with adapter 1318/17 to hose.
- Repeat delivery rate check.

If the minimum delivery rate is now attained:

- Replace fuel filter.

If the minimum delivery rate is again not attained:

- Remove fuel delivery unit and check strainer for soiling.

Only if no faults have been detected up to now:

- Fuel pump is faulty; replace fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .

If the delivery rate has been attained but a fuel supply system fault (e.g. intermittent failure of fuel supply system) is still suspected:

- Check current draw of fuel pump as follows:
- Reconnect all disconnected fuel lines.
- Disconnect 4-pin connector from flange on fuel delivery unit.
- Set multimeter to measuring range 20 A and make a series connection between connector contacts -1- and fuel pump using adapter cables from V.A.G 1594 A.

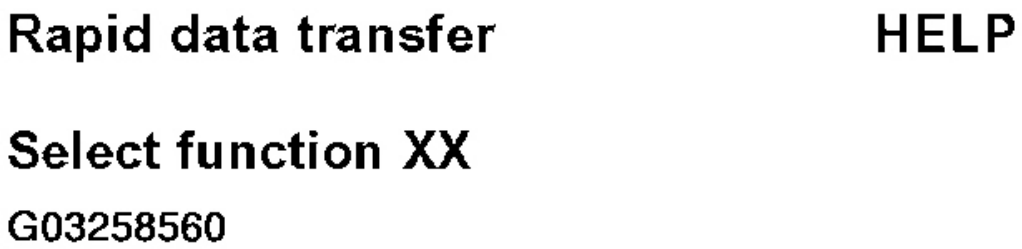

Fig. 33: Connecting Multimeter In Series Between Connector Contacts And Fuel Pump
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The current clamp of multimeter V.A.G 1715 can be connected between contacts -1- of connector and fuel pump, as an alternative solution.

- Bridge contact -4- of connector and fuel pump using adapter cables from V.A.G 1594 A.
- Start engine and run at idling speed.
- Measure current draw of fuel pump.

Specification: max. 8 amps

NOTE: If the fuel system malfunction is intermittent, perform the check during a road test with the help of a 2nd technician.

If the current draw is exceeded:

- Fuel pump is faulty; replace fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .

Checking fuel pump non-return valve

Requirements

- Remote control V.A.G 1348/3A is still connected
- Pressure gauge V.A.G 1318 is still connected

Work sequence

NOTE: With this check the fuel supply line connections from the fuel delivery unit to the point at which the pressure gauge V.A.G 1318 is connected will be checked for leaks at the same time.

- Close pressure gauge cut-off tap (lever across flow direction, position -B-).

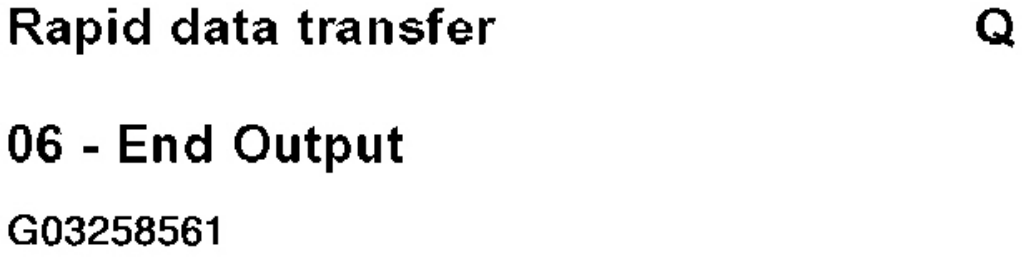

Fig. 34: Checking Fuel System Pressure Drop
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate remote control at short intervals, until a pressure of approx. 3 bar has built up.

WARNING: Danger of spray when opening the shut-off-tap; hold container in front of the free connection on the pressure gauge.

- If pressure builds up too high, lower excess pressure by carefully opening shut-off tap.
- Observe pressure drop on gauge.

  Over a duration of 10 minutes pressure must not drop below 2.5 bar

If the pressure drops further:

- Check line connections for leaks.

If no wiring fault is detected:

- Fuel pump is faulty; replace fuel delivery unit. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING** .

FUEL SYSTEM, BLEEDING

Engine codes BEV, BGD

Special tools, equipment, testers, measuring instruments and auxiliary items required

- V.A.G 1348/3 A Remote control
- V.A.G 1348/3-2 Adapter cable
- VAS 5226 Diesel suction pump
- V.A.G 1318/20 Adapter
- V.A.G 1318/20-1 Adapter

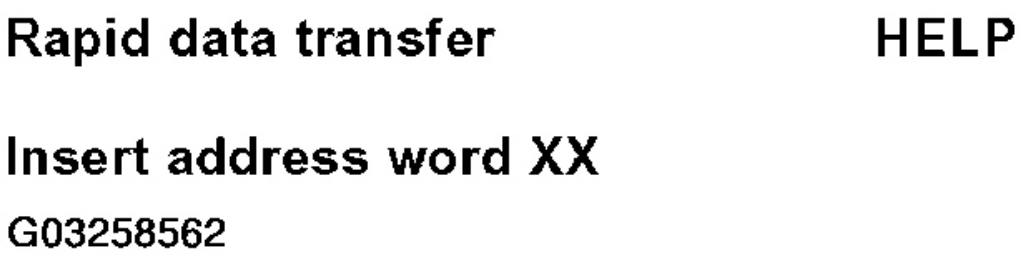

Fig. 35: Identifying Special Tools
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirements

- Fuses must be OK

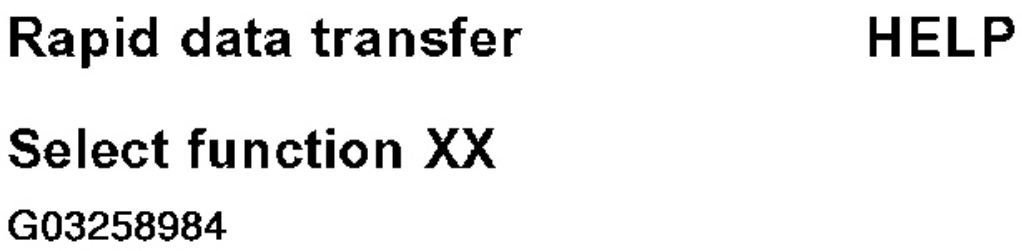

Fig. 36: Locating Fuses (Behind Access Panel At Far Left End Of Dash)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 V
- Fuel pump relay must be OK

Work sequence

- Remove cover in front of fuse holder.
- Pull fuse No. 28 out of fuse holder.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 to contact 28a to fuel pump and battery positive (+).

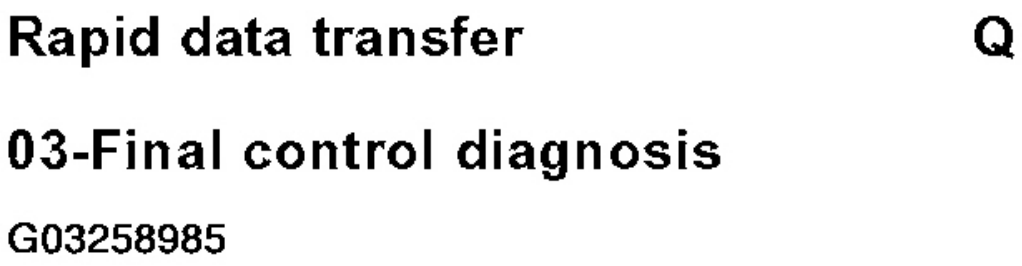

Fig. 37: Connecting Remote Control V.A.G 1348/3A To Fuse Box Fuel Pump Contact
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove pressure hose from secondary air injection pump to combination valve.
- Unscrew cover cap (arrow) of breather valve.

Fig. 38: Removing Breather Valve Cover Cap Screw
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Screw adapter V.A.G 1318/20-1 onto adapter V.A.G 1318/20.

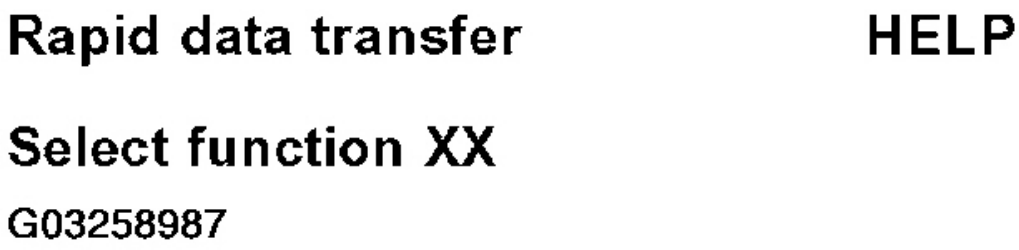

Fig. 39: Identifying V.A.G. 1318/20-1 & V.A.G. 1318/20
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Turn valve (at T-piece) counterclockwise until it is completely open.
- Screw adapter V.A.G 1318/20 hand tight onto breather valve.

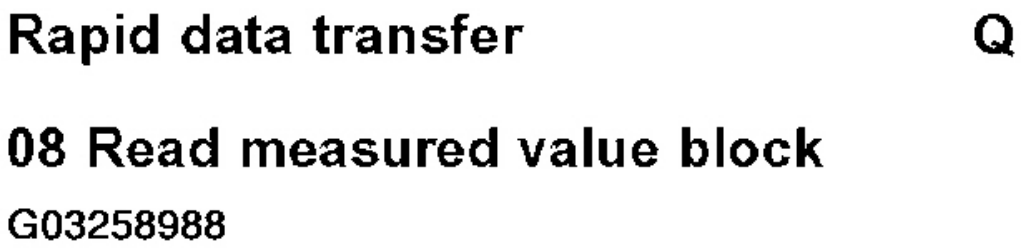

Fig. 40: Screwing Adapter V.A.G 1318/20 Hand Tight Onto Breather Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect hose of diesel suction pump VAS 5226 as shown.
- Turn valve (at T-piece) clockwise into breather valve onto limit stop.
- Check adapters and hose connectors for leaks.
- Operate remote control V.A.G 1348/3A until bubble-free fuel comes out of breather valve.
- Turn valve (at T-piece) counterclockwise again until it is completely open.
- Clamp-off hose of diesel suction pump VAS 5226 (e.g. with hose clamp 3094) and disconnect it from adapter V.A.G 1318/20-1.
- Unscrew adapter V.A.G 1318/20 from breather valve.

ACCELERATOR MECHANISM, SERVICING

ACCELERATOR MECHANISM, COMPONENT OVERVIEW (ENGINE CODE AEG)

NOTE: The following list refers to items in Fig. 41 .

1. **Accelerator cable**
   - Adjusting. See **ACCELERATOR CABLE, ADJUSTING**
   - Do not reuse damaged accelerator cable, replace
2. **Retaining clip**
   - Adjusting accelerator cable. See **ACCELERATOR CABLE, ADJUSTING**
3. **Vibration damper**
4. **Accelerator pedal**
5. **Spacer sleeve**
6. **Bearing socket**
7. **Washer**
8. **Stop bolt**

9. **20 N.m**

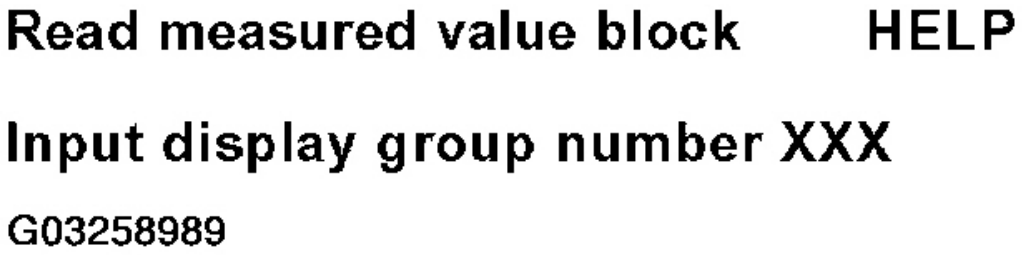

Fig. 41: Exploded View Of Accelerator Mechanism
Courtesy of VOLKSWAGEN OF AMERICA, INC.

ACCELERATOR CABLE, ADJUSTING (ENGINE CODE AEG)

Vehicles with manual transmission

Special tools, equipment, testers, measuring instruments and auxiliary items required

- V.A.G 1788/10 Engine speed regulator

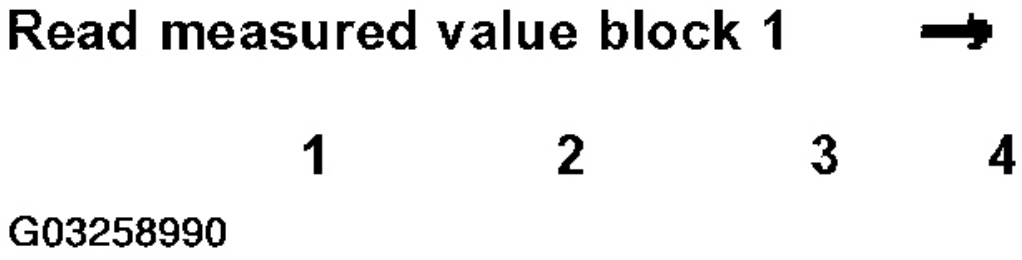

Fig. 42: Identifying V.A.G 1788/10 Engine Speed Regulator
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Work sequence

- Hook accelerator cable into accelerator pedal and cam plate of throttle valve control module.

- Pull off retaining clip for accelerator cable.
- Depress accelerator pedal fully to wide open throttle position.

NOTE: Assistance of a second technician is required or support accelerator pedal against steering wheel using V.A.G 1788/10 speed regulator.

- Adjust accelerator cable by moving retainer on support bracket, so that wide open throttle position is attained on cam plate of throttle valve control module.

Vehicles with automatic transmission

Special tools, equipment, testers, measuring instruments and auxiliary items required

- V.A.G 1788/10 Engine speed regulator
- Hand multimeter V.A.G 1526 A or multimeter V.A.G 1715
- Adapter set V.A.G 1594

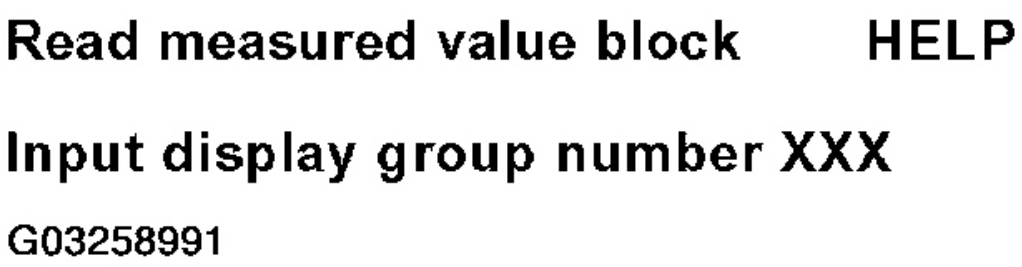

Fig. 43: Identifying Special Tools
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Work sequence

- Adjust accelerator cable by moving retainer on support bracket so that wide open throttle position is attained on cam plate of throttle valve control module.
- Release accelerator pedal.
- Pull 2-pin connector off Kick down switch -F8- in front engine compartment (on bulkhead).
- Connect hand multimeter V.A.G 1526 A with auxiliary cables from V.A.G 1594 to kick down switch.

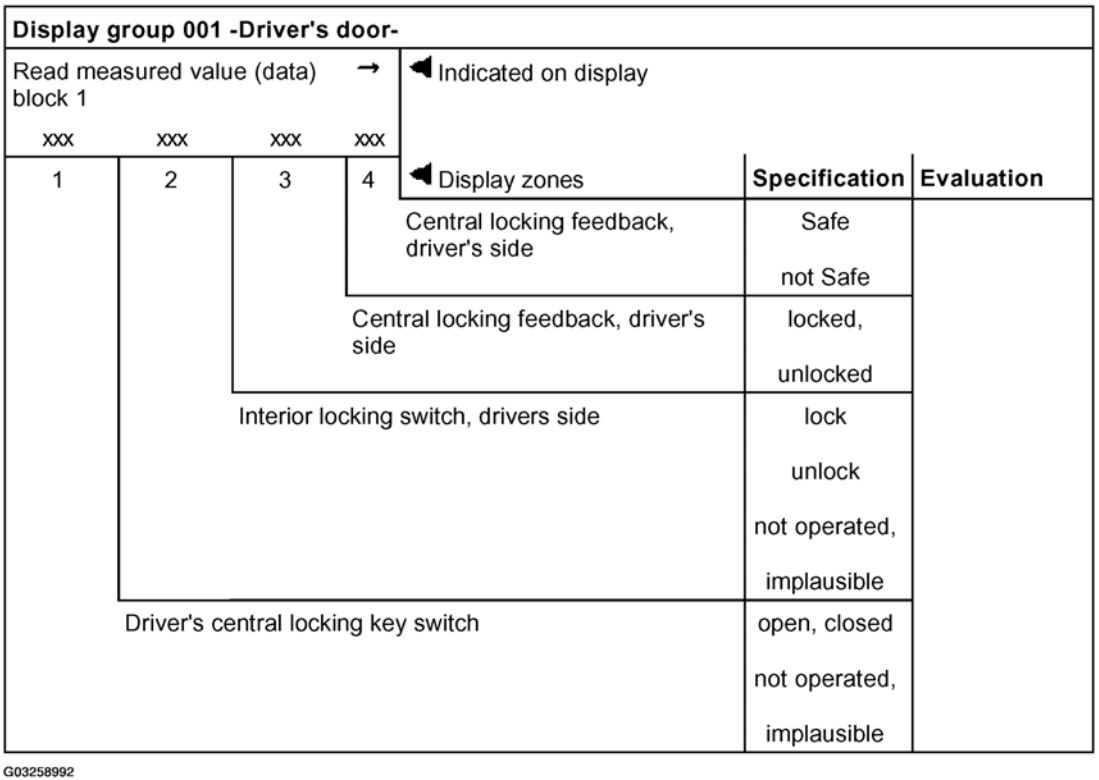

Fig. 44: Measuring Kick Down Switch Resistance
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance at switch

  Specification: "INFINITY" ohms.

- Press accelerator pedal slowly to floor.

  Shortly after kick down switch point resistance must drop at 0 ohm

  Accelerator pedal must be at point just before limit stop

- Adjust accelerator cable by moving retainer on support bracket, so that throttle valve is fully open and kick-down switch clicks audibly.
- Release accelerator pedal or remove speed regulator.
- Once adjustments are complete check idling and wide open throttle limit stops on throttle valve.

ELECTRONIC POWER CONTROL (EPC)

ENGINE CODES AVH, AZG, BDC, BEV, BGD

NOTE: The following list refers to items in Fig. 45 .

1. **Mounting**
2. **Connector**
   - Black, 6-pin
3. **10 N.m**
4. **Throttle Position (TP) sensor -G79- and Sender -2- for accelerator pedal position -G185-**
   - On replacement, for models with automatic transmission, an adaptation must be performed. See **COMPONENTS AND FUNCTIONS, ADAPTING** .
   - When removing remove instrument panel/pedal cluster cover
5. **Retainer**
   - For footwell cover
   - Clipped onto accelerator pedal

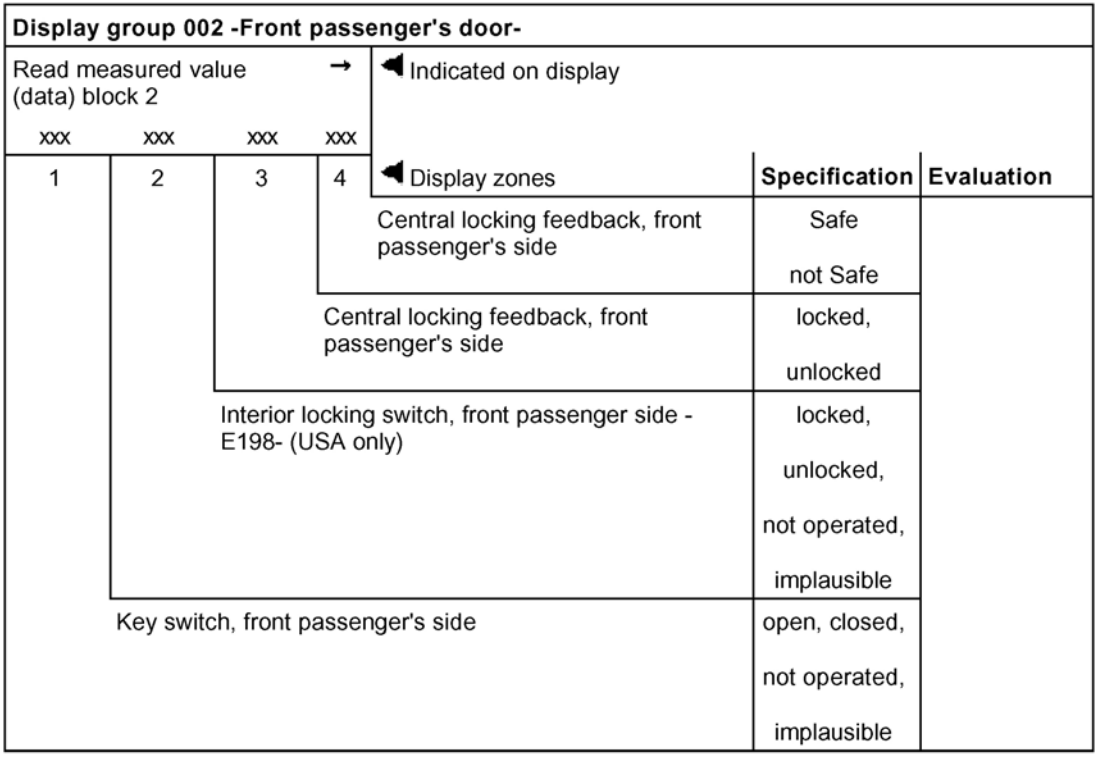

Fig. 45: Exploded View Of Electronic Power Control (EPC) Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

FUNCTION OF EPC SYSTEM

With the EPC system the throttle valve is not operated by the throttle pedal via a cable. There is no mechanical

connection between accelerator and throttle valve.

The position of the accelerator is transmitted to the engine control module by two accelerator position senders (variable resistors; mounted in one housing) which are connected to the accelerator pedal.

The position of the accelerator (drivers requirement) is the main input value for the engine control module.

The throttle valve is operated over the complete revolution and load range by an electric motor (throttle valve positioner) in the throttle valve control module.

The throttle valve is operated by the throttle valve positioner which is controlled by the engine control module.

When the engine is not running and the ignition is switched on the engine control module moves the throttle valve exactly as prescribed by the accelerator pedal position sender. This means that when the accelerator is depressed halfway the throttle valve positioner opens the throttle valve by the same amount, the throttle is then approximately half open.

When the engine is running (under load) the engine control module can open or close the throttle valve independently of the accelerator pedal position sender.

This means that the throttle valve can already be completely open even though the accelerator pedal is depressed half way. This also gives vastly improved consumption and exhaust emission levels at certain load conditions.

After evaluating the torque requirements of various components (e.g. air conditioning system, automatic transmission, ABS/ESP and so on), the engine control module calculates the optimal throttle valve opening angle for the respective situation.

This also gives vastly improved fuel consumption and exhaust emission levels at certain load conditions.

EPC is a system comprising all components which contribute to determining, controlling or monitoring the position of the throttle valve, e.g. accelerator pedal position sender, the throttle valve control module, the EPC warning lamp, the engine control module and so on.

Observe safety precautions. See **SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM** .

Observe rules for cleanliness. See **RULES FOR CLEANLINESS** .

EVAPORATIVE EMISSIONS (EVAP) SYSTEM

FUNCTION

Depending on air pressure and ambient temperature, fuel vapor will form above the level of fuel in the tank.

The EVAP system prevents these HC emissions from escaping into the atmosphere.

In limited quantities, fuel vapors located at the highest point in the tank pass through a gravity valve (which closes at an angle of 45°) and through a pressure retention valve into the EVAP canister.

The activated charcoal in the canister stores these vapors like a sponge.

When the oxygen sensor control is active when driving (engine warm), the EVAP canister purge regulator valve -N80- is activated (pulsed) from the engine control module depending upon load and engine speed. The opening period is dependent on the input signals.

Intake manifold vacuum draws fresh air through the vent opening on the underside of the EVAP canister during the purging procedure (regenerating the activated charcoal). The fuel vapors stored in the activated charcoal and fresh air are fed for combustion in dosed quantities.

The pressure retention valve prevents fuel vapors from being drawn from the tank when the solenoid valve is open and an intake manifold vacuum is present. It therefore ensures that the evacuation of the EVAP canister has priority.

When no voltage is applied (e.g. wiring open circuit), the solenoid valve is closed. The EVAP canister will not be purged.

The vacuum line from the throttle valve control module to the EVAP canister has an additional bypass which is connected with the crankcase breather valve. The non-return valve integrated in the crankcase breather valve prevents the intake air gassing into the crankcase during some partial load ranges. This improves the overall crankcase breathing. The bypass guarantees the crankcase breathing.

Functional description of leak diagnosis

The EVAP system (including the fuel tank) is equipped with a leak diagnosis. This diagnosis system detects leaks in breather system.

This diagnosis is based on the pressure principle and should detect leaks with a circumference larger than 1 mm.

During the diagnosis the Leak Detection Pump (LDP) -V144- creates a pressure of 30 mbar in the EVAP system. When the pressure is attained the pump switches off. If the pressure drops below a predetermined value the pump switches on again. The self-diagnosis monitors the switching periods and sets a fault in the fault memory when the period is too short.

Observe safety precautions. See **SAFETY PRECAUTIONS WHEN WORKING ON THE FUEL SUPPLY SYSTEM** .

Observe rules for cleanliness. See **RULES FOR CLEANLINESS** .

EVAP system components, servicing. See **EVAP SYSTEM COMPONENTS, SERVICING** .

EVAP system, assembly overview. See **EVAPORATIVE EMISSIONS (EVAP) SYSTEM, ASSEMBLY OVERVIEW** .

NOTE:

- **Hose connections are secured with either spring-type or clamp-type clips.**
- **Always replace clamp-type clips with spring-type clips.**
- **Always replace clamp-type clips with spring-type clips. Assembly tool VAS 5024 or hose clip pliers V.A.G 1921 are recommended for installing spring-type clips.**

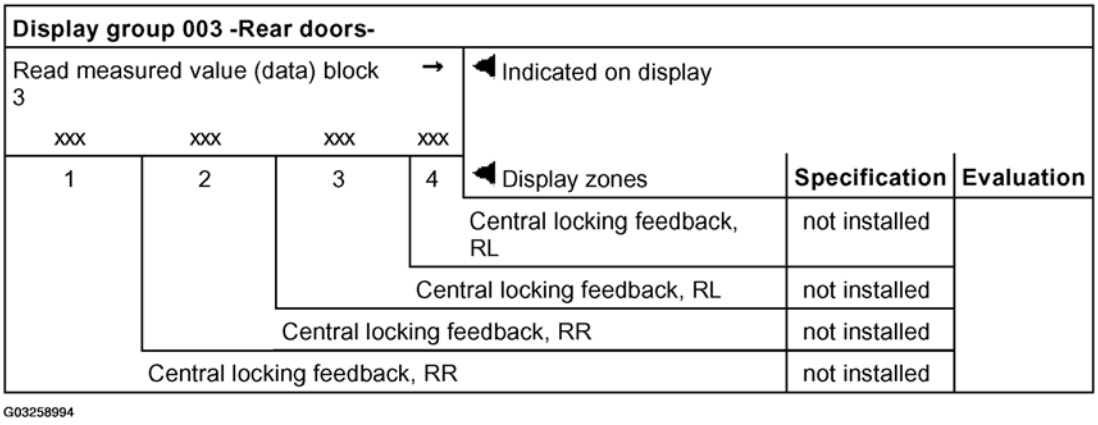

Fig. 46: Identifying Special Tool
Courtesy of VOLKSWAGEN OF AMERICA, INC.

EVAP SYSTEM COMPONENTS, SERVICING

NOTE: **The following list refers to items in Fig. 47 .**

- **Components marked with an * are checked by the self-diagnosis.**

  See Diagnostic tester VAS 5051; Vehicle self-diagnosis

- **Components marked with ** are checked by the final control diagnosis.**

  See Diagnostic tester VAS 5051; Vehicle self-diagnosis

NOTE: **The following list refers to items in Fig. 47 .**

1. **Leak Detection Pump (LDP) -V144-*/****
   - In right rear wheel housing, behind wheel housing liner
2. **Connector**
   - Black, 3-pin
3. **Vacuum line**
   - To intake manifold upper part. See **Fig. 49** , item -6-.

- Press together at front to release

4. **Breather pipe**
   - Black
   - Check if seated securely
   - From changeover valve on fuel tank. See **ENGINE CODES BEV, BGD** , item -14-
   - Press together at front to release
5. **To EVAP canister purge regulator valve -N80-**
   - White
   - Check if seated securely
   - To EVAP canister purge regulator valve -N80-.
6. **EVAP canister**
   - In right rear wheel housing, behind wheel housing liner
   - To remove and install, remove turn signals
7. **10 N.m**
8. **2 N.m**
9. **Air filter for leak detection pump**
10. **Connecting hose**
    - Suction side
11. **Connecting hose**
    - Pressure side

Display group 004 -Central control unit-

Read measured value (data) block 4 → Indicated on display

xxx	xxx	xxx		Display zones	Specification	Evaluation
1	2	3	4			
				Empty[1)]		
				Rotary latch switch, rear	not installed	
				Rotary latch switch, front passenger's side	door open, door closed	
				Rotary latch switch, driver's side	door open, door closed	

[1)] Empty means in this case: Display zone is blank

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Fig. 47: Exploded View Of EVAP System Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

EVAPORATIVE EMISSIONS (EVAP) SYSTEM, ASSEMBLY OVERVIEW

Engine codes AEG, AVH, AZG

- Engine code BDC. See **ENGINE CODE BDC**
- Engine codes BEV, BGD. See **ENGINE CODES BEV, BGD**

NOTE: The following list refers to items in Fig. 48 .

1. **Tank flap unit**
   - With rubber cup
2. **Fuel tank**
   - When removing, support with engine/transmission jack V.A.G 1383 A
     - Removing and installing. See **FUEL TANK, REMOVING AND INSTALLING**
3. **Fuel delivery unit**
   - Removing and installing. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING**
4. **Throttle valve control module -J338-**
5. **Intake manifold upper part**
6. **Fuel rail with injectors**
7. **Fuel pressure regulator**
8. **Fuel filter**
   - Installed position: Arrow points in direction of flow
9. **EVAP canister purge regulator valve -N80-**
   - On right in engine compartment above wheel housing liner
   - Installed position: Arrow points in direction of flow
   - Valve will be activated by engine control module (pulsed)
10. **Test union**
11. **Gravity valve**
12. **Pressure retention valve**
    - For fuel tank breather
    - Checking. See **Checking Pressure Retention Valve**
13. **Change-over valve**
    - Check. See **Checking Change-Over Valve**
14. **EVAP canister**
    - In right rear wheel housing, behind wheel housing liner
15. **Leak Detection Pump (LDP) -V144-**
    - At EVAP canister
    - Pump will be activated by engine control module (pulsed)
16. **Air filter for LDP**

Display group 005 -Central control unit-						
Read measured value (data) block → 5				◀ Indicated on display		
xxx	xxx	xxx	xxx			
1	2	3	4	◀ Display zones	**Specification**	**Evaluation**
				Interior monitor sensor	yes no not installed	
				Remote control unit key button	open, closed, RLR[1], Panic[2] (with 0 or 1)	
				Speed signal (Steps: 2 km/h)	mv 0 km/h (Steps: 2 km/h)	
				Central locking temperature switch-off	yes, no	

[1] Only vehicles for USA, RLR= Rear lid Remote release

[2] Only vehicles for USA, alarm system and turn signal lights are activated

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Fig. 48: Hose Routing Diagram Of Evaporative Emissions (EVAP) System (Engine Codes AEG, AVH, AZG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Engine code BDC

NOTE: The following list refers to items in Fig. 49 .

1. **Tank flap unit**
2. **Fuel tank**
   - When removing, support with engine/transmission jack V.A.G 1383 A
     - Removing and installing. See **FUEL TANK, REMOVING AND INSTALLING**
3. **Fuel delivery unit**
   - Removing and installing. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING**
4. **Intake hose**
5. **Throttle valve control module -J338-***
6. **Intake manifold upper part**
7. **Fuel rail with injectors**
8. **Fuel pressure regulator**

9. **Fuel filter**
    - Installed position: Arrow points in direction of flow
10. **EVAP canister purge regulator valve -N80-*/****
    - On right in engine compartment above wheel housing liner
    - Installed position: Arrow points in direction of flow
    - Valve will be activated by engine control module (pulsed)
11. **Test union**
    - Not installed on all models
12. **Gravity valve**
13. **Pressure retention valve**
    - For fuel tank breather
    - Checking. See **Checking Pressure Retention Valve**
14. **Change-over valve**
    - Check. See **Checking Change-Over Valve**
15. **EVAP canister**
    - In right rear wheel housing, behind wheel housing liner
16. **Leak Detection Pump (LDP) -V144-*/****
    - In right rear wheel housing, behind wheel housing liner
    - Valve will be activated by engine control module (pulsed)
17. **Air filter for leak detection pump**

Display group 006 -Central control unit-

Read measured value (data) block 6 →

xxx	xxx	xxx	xxx	◄ Indicated on display		
1	2	3	4	◄ Display zones	**Specification**	**Evaluation**
				Ignition	Terminal 15 on, Terminal 15 off	
				Tailgate key switch	open, closed, not operated implausible	
				Key number[1)]	0,1, 2, 3, 4	
				S-terminal	operated, not operated	

[1)] Display 1 for remote control key 1 is performed by operating a button on remote control key

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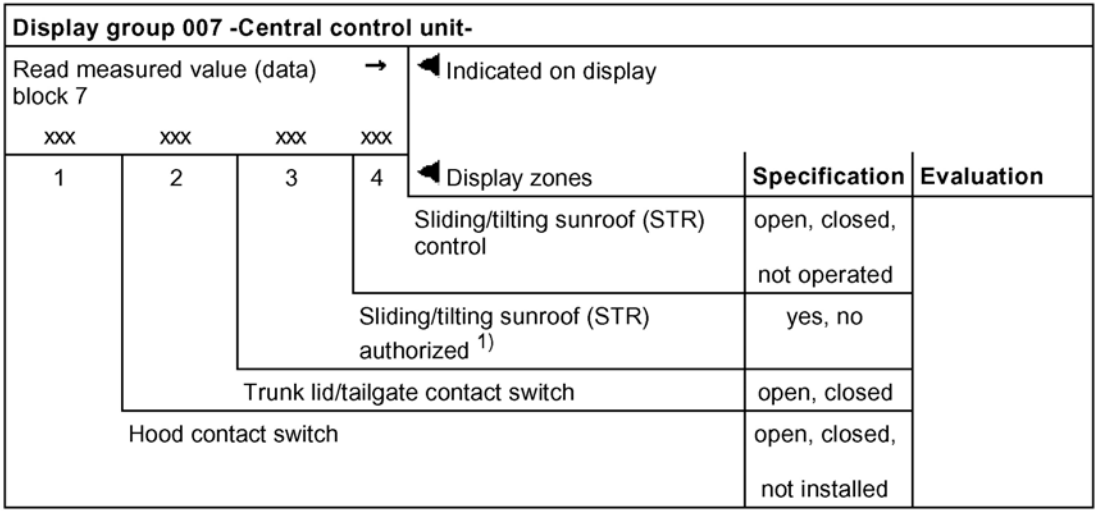
Fig. 49: Hose Routing Diagram Of Evaporative Emissions (EVAP) System (Engine Code BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Engine codes BEV, BGD

NOTE: The following list refers to items in Fig. 50 .

1. **Tank flap unit**
2. **Fuel tank**
   - When removing, support with engine/transmission jack V.A.G 1383 A
     - Removing and installing. See **FUEL TANK, REMOVING AND INSTALLING**
3. **Fuel delivery unit**
   - Removing and installing. See **FUEL DELIVERY UNIT, REMOVING AND INSTALLING**
4. **Intake hose**
5. **Throttle valve control module -J338-**
6. **Intake manifold upper part**
7. **Fuel rail with injectors**
8. **Fuel filter**
   - Installed position: Arrow points in direction of flow
   - With fuel pressure regulator
9. **EVAP canister purge regulator valve -N80-**
   - On right in engine compartment above wheel housing liner
   - Installed position: Arrow points in direction of flow
   - Valve will be activated by engine control module (pulsed)
10. **Gravity valve**
11. **Pressure retention valve**
    - For fuel tank breather
    - Checking. See **Checking Pressure Retention Valve**
12. **Change-over valve**
    - Check. See **Checking Change-Over Valve**
13. **EVAP canister**
    - In right rear wheel housing, behind wheel housing liner
14. **Leak Detection Pump (LDP) -V144-**
    - In right rear wheel housing, behind wheel housing liner
    - Valve will be activated by engine control module (pulsed)
15. **Air filter for leak detection pump**



Display group 007 -Central control unit-

Read measured value (data) block 7 →

◀ Indicated on display

xxx	xxx	xxx	xxx	◀ Display zones	Specification	Evaluation
1	2	3	4	Sliding/tilting sunroof (STR) control	open, closed, not operated	
				Sliding/tilting sunroof (STR) authorized 1)	yes, no	
				Trunk lid/tailgate contact switch	open, closed	
				Hood contact switch	open, closed, not installed	

1) The control unit sends a "switch-off delay" terminal 15 to sliding/tilting sunroof. Therefore the operation of the sliding/tilting sunroof is still possible, after switching off the ignition, and until a door is opened.

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Fig. 50: Hose Routing Diagram Of Evaporative Emissions (EVAP) System (Engine Codes BEV, BGD)
Courtesy of VOLKSWAGEN OF AMERICA, INC.